THE IMPACT OF INTERNATIONAL COFFEE ORGANIZATION DISSOLUTION ON INDONESIAN PTP COFFEE PRICES

By

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PRICES

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CHAPTER I

INTRODUCTION

In Indonesia, coffee trails only rubber in commodity export value. Indonesian coffee exports were U.S. $361 million in 1991, or nearly 16 percent of Indonesia's total agricultural product, which is U.S. $2.3 billion (National Development Information Office, 1992). Indonesia is trying to increase the export value of non-oil products which makes knowledge of factors influencing the value of coffee exports important information for agricultural development policy as well as trade policy decision making.

Indonesia produces both Robusta and Arabica coffees. About 90 percent of coffee produced is Robusta which is produced all over Indonesia. The other ten percent is Arabica coffee which is mainly produced in East Java. Arabica coffee was produced by Indonesia in the 16th century, however, because of bad weather conditions in the early 18th century, almost all Arabica plantations were destroyed. Robusta coffee was introduced because it is much more resistant than Arabica coffee to coffee rust leaf disease (Hemilera vastatrix). Today, Indonesia is the third world's largest producer of coffee after Brazil and Columbia, and is the largest Robusta coffee producer in the world. Robusta prices are much lower

than Arabica prices. Arabica is valued because it has a specific taste caused by acidity and also because Arabica has a less caffeine than does Robusta.

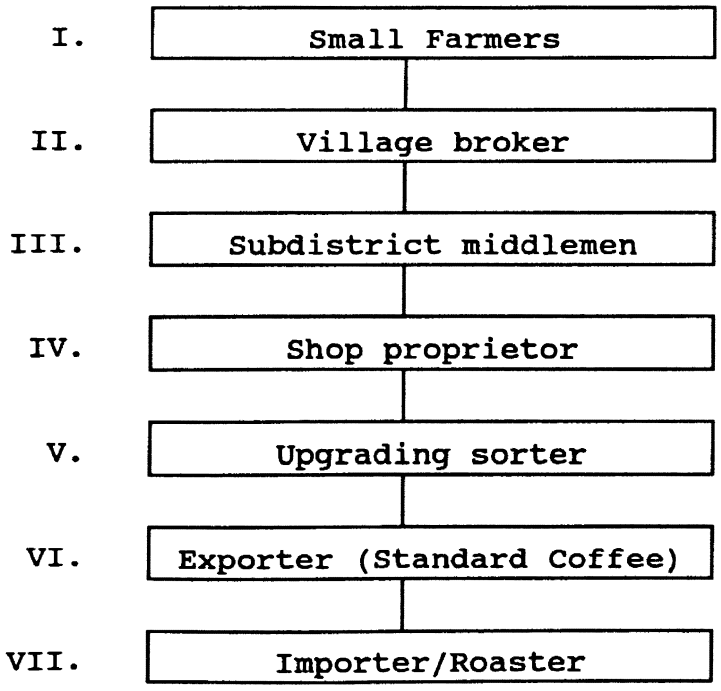
In 1991, Indonesia had over 1,070 thousand hectares of coffee, of which, approximately 83 percent (1,010,831 ha) is produced by small farmers all over Indonesia that have 0.5 to 1.0 hectare in coffee (Asosiasi Eksportir Kopi Indonesia, 1992). Five percent (54,607 ha) is produced by four government estate companies or PTPs located mainly on Java (Asosiasi Eksportir Kopi Indonesia, 1992). Two percent is produced by private companies. PTPs have been selected by the government to help small farmers improve the quality of their coffee.

Independent farmers and PTPs use different agricultural practices and production processes. Small farmers usually produce low and inconsistent coffee quality which is usually harvested at the immature, green-bean stage. PTPs produce high and consistent coffee quality which is harvested at the mature, red-bean stage. Maturing from the green-bean to red-bean stage takes four months. Small farmers seldom use fertilizer and pesticides as do PTPs. Small farmers usually dry coffee in the sunshine after it is harvested. The berries are dried until the beans inside the hulls are loose (Mwandha et al., 1985).

The PTPs use a method which takes longer and is more expensive, but produces a cleaner bean which usually sells at a higher price (Mwandha et al ., 1985). PTPs wash coffee bean

in water. Good quality beans sink. Bad quality beans float since they usually have holes caused by insects. After soaking, coffee is dried using air heated from burning coffee hulls.

Transaction data for small coffee farmers are difficult to obtain. The number and location of farmers cultivating coffee varies from year to year and the marketing channel from producer to importer is quite long, as shown in Figure 1. In addition, the number of exporters has grown from 300 in 1988 to 1050 exporters in 1991.



Source: Aminuddin, 1986

Figure 1. The small farmer exporting system in Indonesia.

PTPs contract directly with buyers/importers or indirectly through the Kantor Pemasaran Bersama (KPB) which is the joint marketing office of the PTP enterprises. PTP and KPB employees directly negotiate sales with coffee buyers and thus can better understand buyers needs.

Price Trends and the International Coffee Agreement

Indonesia participated in the International Coffee Agreement (ICA) and the International Coffee Organization (ICO). The International Coffee Agreement began on September 24, 1959 in Washington D.C., and was improved and officially announced on September 1962 with 23 member countries. The ICA was supervised by the International Coffee Organization. The ICA sought to stabilize world coffee supply and demand, provide stable and reasonable profits for producing countries and stabilize prices for consuming countries. Using a two tier market (quota market member and non-quota market member), price was maintained in a specified range defined by a price floor and a price ceiling. In later years of the agreement, non-quota prices have been below quota prices.

By 1988, 50 producing countries and 25 consuming countries were ICO members. The exporting members of ICO can be grouped by main type of coffee produced: Columbian Milds, Other Milds, Brazilian and Other Arabicas and Robustas as shown in Table 1. The basic quotas under the provisions of Article 30 of the International Coffee Agreement 1983 (ICO, 1992) are shown in Table 1.

Quotas were in effect from October 1, 1980 to 18 February 1986 and from 6 October 1987 until July 4, 1989. Of the total global quota system in ICA (1989), the four largest quota percentages were Brazil (31 %), Columbia (16 %), Indonesia (5 %), OAMCAF or the organization of African coffee exporters (12 %). The three leading consuming countries have Japan (65 %), USA (38 %) and EBP (30 %). Thus, Indonesia only received five percent of the total global ICO quota, or about 150 to 200 thousand tons. The actual export capacity of Indonesia was 300 to 350 thousand tons per year. Indonesia sold its excess supply to non-quota members at much lower prices.

In July 1989 the two groups of producing countries disagreed. The Geneva group is mostly the countries involved in developing the 1962 coffee agreement. The Geneva group includes South American countries, such as Brazil and Columbia, who wanted the quota system to continue based on the 1962 agreement. The second group, which consists of countries joining the ICO after the 1962 agreement, such as Indonesia, wanted to renew agreement but adjust the quota to the amount of coffee which had been produced by a country in recent years. Consuming countries wanted the quota applied to all markets and no non-quota sales. Because of the disagreement, the ICO abandoned the world coffee quota system on July 4, 1989.

Following the 1989 dissolution of the quota system, the world market has been deluged by coffee products from producing countries which had excess stocks of coffee and

Table 1. Size of Quota by Type of Coffee and Country of Origin, 1988/89.

Type of Coffee and Country of Origin	000(bags)	Type of Coffee and Country of Origin	000(bags)
Col. Mild:	1,694	Brazilian &	2,518
Columbia	1,336	O. Arabicas:	
Kenya	264	Brazil	2,403
Tanzania	94	Ethiopia	114
Other Mild:	4,380	Robustas:	4,151
Costa Rica	663	Angola	0
Dominican Rep.	12	Indonesia	2,789
Ecuador	398	OAMCAF	352
El Salvador	83	Philippines	43
Guatemala	581	Uganda	532
Honduras	474	Vietnam	369
India	1,231	Zaire	67
Mexico	104		
Nicaragua	9		
P. N. Guinea	671		
Peru	155		

Source: ICO, 1992

excess production capacity under the quota system. Worldcoffee prices dropped from U.S. $1.38/lb on July 1989 to U.S. $0.69/lb on November 1991, the lowest coffee price in 14 years. Indonesia has been hurt by the low price received, in 1986 the average Indonesia coffee price was U.S. $2.1/kg, it dropped to U.S. $0.9/kg in 1990 and it dropped further to U.S. $0.84/kg in 1991. After the ICO dissolved on July 4, 1989 the Indonesian government deregulated coffee exporting. As a result of the deregulation, the number of exporters has grown from 300 in 1988 to 1050 in 1991. Indonesian coffee production is expected to decrease because of the low price received. Today, leading producing countries want to form a new International Coffee Agreement (ICA) where leading coffee producing countries will adopt a quota system without consuming countries participating in the agreement. Indonesia wants to be part of the new agreement. The problem is that while the impact of the abandonment of the ICO on aggregate prices is known, impacts on different grades and types of coffee are not well known.

The general objective of this thesis is provide information that government officials and PTP managers can use to better understand variation in prices received and the impacts of ICO abandonment on prices received. Specific objectives are:

1. Determine the premiums and discounts for different grades of coffee;
2. Determine whether reputation of the PTP enterprises is

important in the coffee market;

3. Determine the International Coffee Agreement effect on price received of different grades of for Indonesian coffee by PTP enterprises;
4. Determine the relationship of Indonesian coffee prices and prices in world markets;
5. Determine the seasonal pattern of Indonesian coffee prices; and
6. Determine the effect of size of lot on the price received.

This thesis consists of five chapters. The relevant economic theory is described in Chapter II, methods are described in chapter III, results are in Chapter IV, and conclusions of the thesis are in Chapter V.

CHAPTER II

RELEVANT ECONOMIC THEORY

The underlying principle theme of hedonic price analysis is that consumer goods and inputs to production processes are valued because of their characteristics. Both the theory of consumer behavior and the theory of the profit maximizing firm have been used to derive hedonic functions which suggest that the price of the good is a function of its characteristics.

Lancaster (1966) introduced the concept of heterogenous goods have a bundle of characteristics that have value to consumers. The arguments of Lancaster's utility functions are quantities of characteristics of goods rather than quantities of the goods themselves. Lancaster shows that the prices of heterogeneous goods are related to the marginal yields of the characteristics from the goods and the marginal utility of the characteristics. Using an approach similar to Lancaster, Ladd and Suvannunt (1976) derive the hedonic model from consumer utility maximization subject to a budget constraint. Their empirical findings for meat products are consistent with their hypothesis that retail price paid is a weighted linear combination of a product's yield of characteristics, each weight being a marginal implicit price of a characteristic. Consumer demand for a product then is a function of income,

product prices and product's yields of characteristics.

Ladd and Martin (1976) and Wilson (1984) derive the hedonic model from firm's production function and profit maximizing hypothesis. Ladd and Martin (1976) further show how the implicit prices of input characteristics in linear programming problem are as the shadow prices of the characteristics. Assuming that each product's production function is independent, a multiproduct firm uses a total quantity of each product's characteristic in producing output to maximize profit. Characteristics are the inputs to production and limiting characteristics have positive marginal implicit prices.

Rosen (1974) showed that typically, estimated hedonic price functions identify neither demand nor supply functions and cannot be used to identify the structure of consumer preferences and producer technologies that interact to generate the hedonic prices. Hedonic price functions are generally used to explain variation in prices of heterogenous products given the general price level. Hedonic functions are not used to explain variation in the overall price level but are used to explain deviations in prices that are systematically associated with the characteristics of the goods. Brorsen, Grant and Rister suggest that market forces operating over time must be considered when estimating hedonic functions with data that are generated over time.

Empirically, hedonic functions become regression equations in which prices are the dependent variable and the

characteristics of that product are the independent or explanatory variables (Triplett, 1986). The estimated parameters from the hedonic prices are the shadow prices or implicit prices (Ladd and Martin, 1976) of the characteristics of a commodity.

Numerous hedonic price models have been developed for agricultural products (Brorsen et al., 1984; Bowman and Ethridge, 1992; Ethridge and Davis, 1982; Ladd and Martin, 1976; Djunaidi et al., 1993, Margoluis and Tilley, 1982) and non-agricultural products (Triplett, 1986; Thomas, 1983; and Barktik, 1987). Hedonic price analyses for coffee have not been published.

Shapiro contributes to the concept of hedonic price analysis by recognizing that all products with the exact same physical characteristics will not necessarily be valued identically in the market. Shapiro suggests that company reputation or the companies goodwill may be a factor in explaining price variation across firms. Shapiro (1983) suggests that reputation value only makes sense in a market with imperfect buyer information. When product attributes are difficult to fully observe at the time of purchase, the quality of products produced by a firm may be related to past experience of buyers with products from a specific firm. Thus, a firm will have a good reputation only if consumers (buyers) believe that the firm's products or service are of high quality. Reputation selling, has particular usefulness in markets where buyers build beliefs through experience and

sellers develop reputations because both are involved in numerous similar transactions over time. In addition, reputation selling may be particularly prevalent in markets where there is not sufficient information provided by grading systems to allow buyers to fully evaluate a product.

Turner et al. (1993) hypothesized that sellers' reputations are an important factor in buyer's price bidding decisions in electronic feeder cattle markets in Georgia. This is the only previous reputation selling paper published in the agricultural economics literature. Turner et al. (1993) used a variety of characteristics as well as the size of the lot and number of buyers at the auction.

Extensive coffee grading systems have been developed to provide information about the characteristics of coffee beans traded in international markets. The question of reputation selling then becomes one of determining whether company of origin is an important consideration among buyers when making purchasing decisions. It would be expected to be important in situations in which grade of coffee does not convey sufficient information to place an accurate value on a lot.

While no previous studies of hedonic prices of coffee exist, economic studies of world coffee price determination. Herrmann and Kirschke (1987) show that price uncertainty in the coffee market depend on structure of the market.

Palm and Vogelvang (1986) show how international trade flows of coffee are determined by the optimizing behavior of the agents (countries) on the model. These studies (Herrmann

and Kirschke, 1987; Palm and Vogelvang, 1986) were done before the ICO dissolution on July 4, 1989 at which time the coffee market structure changed.

The heterogeneity of the products consumers' purchase as well as the heterogeneity of the coffee beans purchased by buyers as inputs into the production of coffee blends and brands suggest that either the theory of the consumer behavior or the theory of the profit maximizing firm could be used to derive hedonic functions for coffee. Theoretically, coffee beans are valued because of their ability to produce characteristics for specific blends for which coffee manufacturers have developed a consumer market. The coffee blending problem faced by a processor is similar to the corn blending problem analyzed by Ladd and Martin except that coffee processors can alter the flavor characteristics of coffee beans during the roasting process.

To summarize, previous literature on hedonic prices and reputation selling suggests the following hypotheses:

1. Prices of coffee should be related to its characteristics which will be measured by the grade given to the coffee and the size of the lot being sold;
2. Models using time series data for hedonic price estimation should include a market equilibrium price as well as structural change variables to reflect changes in market conditions over time and within a season; and
3. Reputation of a firm may be important in markets where grades do not provide sufficient information about the

product being marketed.

Models are developed for coffee in the following chapter that incorporate all three of the principal concepts developed from the theory.

CHAPTER III

METHODS

The data, empirical models, and estimation procedures used to estimate hedonic functions for coffee are described in this section.

Data

Complete sales data are available from four coffee-producing government estate crop enterprises (PTP XVIII, PTP XXIII, PTP XXVI and PTP XXIX) for four production and marketing seasons (1987/88 through 1990/91). The PTP enterprises account for only 5 percent of total production (Biro Pusat Statistik, 1991). The primarily market washed products that are sold in international channels. Of the 48 months of data, 22 months were prior to the dissolution of the ICA and 26 months are after the agreement was abandoned.

Both Arabica and Robusta coffee sales are in the data set. PTP XXVI is the only PTP which sold Arabica coffee Robusta coffee is sold by all four of the companies. There are 296 Arabica and 967 Robusta transactions in the four season data period. The coffee season starts on September 1 and ends on August 30 of the following year. Data on each transaction includes CIF (Cost Insurance Freight), CAF (Cost

and Freight), FOB value, transaction date, the amount of Arabica coffee bought (lot size), buyer, grade and country of destination. All prices are negotiated private treaties between the buyers and sellers.

Coffee Grade Determination

Green coffee beans are the seeds of the coffee plant (Coffea spp.) in the naked form and before roasting are of three species: 1) Robusta (R), 2) Arabica (A), and 3) others (Directorate for Standardization and Quality Control, 1982). The green beans are further classified according to method of processing (dry processed (DP) and wet processed (WP)). Dry processed green beans should contain less than 13 percent moisture leave in while wet processed green beans should have less than of 12 percent moisture leave in.

Robusta coffee has three size categories: (L) large, (M) medium and (S) small beans. For other than Robusta coffee, the bean size is not specified. Large beans are retained by a screen having round holes of 7.5 mm diameter, with a maximum of 2.5 percent passing through. Medium beans can pass through a screen having round holes of 7.5 mm diameter and retained by a screen having round holes of 6.5 mm diameter with a maximum of 2.5 percent passing through. Small beans will pass through a screen with round holes of 6.5 mm diameter and are retained by a screen with round holes of 5.5 mm diameter with a maximum of 2.5 percent passing through.

Each grade is further numbered 1, 2, 3, 4, 5 and 6 with

6 being the lowest grade. The numbered grades are related to the number of defects in a sample. The general requirements for processed green beans are:

1) extraneous matter (sticks, stones, dirt and other foreign material) is less than 0.5 percent of weight;
2) live insects cannot be present;
3) beans that have been stung by insects or have holes cannot be present; and
4) beans cannot have a moldy odor and moldy beans cannot be present.

Each lot is evaluated for defects as shown in Table 2 below. The numerical grade is determined by the total value of defects contained in a 300 gram sample of the beans. The value of each defect in the sample of green coffee beans subject is shown in Table 3.

Table 2. Description of Factor Used in Grade Classifications of Coffee.

Grade	Requirements
Grade 1	Total value of defects maximum 11
Grade 2	Total value of defects between 12 and 25
Grade 3	Total value of defects between 26 and 44
Grade 4	Total value of defects between 45 and 80
Grade 5	Total value of defects between 81 and 150
Grade 6	Total value of defects between 151 and 225

Source: Directorate for Standardization and Quality Control, 1982, Ministry of Trade and Cooperative

Table 3. Determination of the Value of Defects of Indonesian Wet Processed Green Robusta Coffee Beans.

No.	Type of Defect Per 300 Gram Sample of Beans	Value Assigned to the defects
1.	1 (one) black bean	1 (one)
2.	2 (two) partly black bean	1 (one)
3.	2 (two) broken black beans	1 (one)
4.	1 (one) husk coffee	1 (one)
5.	4 (four) brown beans	1 (one)
6.	1 (one) large husk fragment	1 (one)
7.	2 (two) medium husk fragments	1 (one)
8.	5 (five) small husk fragments	1 (one)
9.	10 (ten) beans in silver skin[a]	1 (one)
10.	2 (two) beans in parchment	1 (one)
11.	2 (two) large parchment fragments	1 (one)
12.	5 (five) medium parchment fragments	1 (one)
13.	10 (ten) small parchment fragments	1 (one)
14.	5 (five) broken beans	1 (one)
15.	5 (five) immature beans	1 (one)
16.	10 (ten) beans with one hole	1 (one)
17.	5 (five) beans with more than one hole	1 (one)
18.	10 (ten) spotted beans (wet process)	1 (one)
19.	1 (one) large stick, piece of hard earth or stone	5 (five)
20.	1 (one) medium stick, piece of hard earth or stone	2 (two)
21.	1 (one) small stick, piece of hard each of stone	1 (one)

Source: Directorate for Standardization and Quality Control, 1982, Ministry of Trade and Cooperative.

Model

Based on the theoretical discussion of Chapter 2, two alternative hedonic models are estimated, one for Robusta and one for Arabica. Linear hedonic models are hypothesized to be appropriate for coffee which implies that grade differentials are constant nominal values rather than a percentage of the value. Because of the large change in price levels following the abandonment of the coffee agreement, the model is specified such that grade differentials during and after the agreement are allowed to be different. The hedonic coffee model for Arabica is:

$$(1)\ P_i=\beta_0+\sum_{j=1}^{3}\delta_j GR_{ij}+\beta_1 AG_i+\sum_{k=1}^{3}\gamma_k(AG*GR_{ij})+\beta_2 CP_i$$
$$+\beta_3 SIN_{6,i}+\beta_4 SIN_{12,i}+\beta_5 COS_{6,i}+\beta_6 COS_{12,i}+\beta_7 QTY_i+\epsilon_i$$

The hedonic coffee model for Robusta is:

$$(2)\ P_i=\beta_0+\sum_{j=1}^{15}\delta_j GR_{ij}+\sum_{l=1}^{4}\theta_l PTP_{i,l}+\beta_1 AG_i+\sum_{k=1}^{15}\gamma_k(AG*GR_{ij})+\beta_2 CP_i$$
$$+\beta_3 SIN_{6,i}+\beta_4 SIN_{12,i}+\beta_5 COS_{6,i}+\beta_6 COS_{12,i}$$
$$+\beta_7 QTY_i+\beta_8 DUM_i+\epsilon_i$$

where :

i = 1, ... 296 lots sold for Arabica coffee (equation 1);

i = 1, ... 967 lots sold for Robusta coffee (equation 2);

ϵ_i in equations 1 and 2 are error terms;

P_i is the price of coffee sold in US cents per kg;

AG_i is 1 if the ICA is in effect;

GR_{ij} is 1 if lot i is of grade j, zero otherwise;

CP_i is the cash price of coffee in New York on the day that lot i is sold in Indonesia, US dollars per kilogram;

PTP_{il} is 1 if lot i is from PTP l, zero otherwise;

SIN and COS are sine and cosine functions with the 6 and 12 subscripts indicating six and 12 month periodicity;

QTY_i is the number of kilograms in lot i;

DUM_i is 1 if the price used is a CIF price rather than a CAF price; and

The dependent variable, price of coffee, is negotiated by private treaty between the buyer and seller. When the ICO was effective, prices were within a range set by the ICO and after dissolution they were negotiated in a free market.

The variables included in the model allow direct tests of hypotheses that are relevant to the specific objectives listed in Chapter I:

1. To measure the premiums and discounts for different grades of coffee, dummy variables for grades are included. These are direct measures of premiums and discounts after the agreement was abandoned. Washed coffee grades with fewer defects are expected to receive a premium.
2. To determine whether evidence of reputation selling

among the PTP enterprises exists, dummy variables for the PTP enterprises are included in the Robusta model (only one company sold Arabica coffee).

3. To determine the impact of the International Coffee Agreement on price received for Indonesian coffee an intercept shifter, AG_i is included. The agreement dummy variable is also involved as an interaction with the dummy variables for grades to allow for differences in grade premiums and discounts before and after the agreement was abandoned.
4. To determine the relationship between Indonesian coffee prices and prices in world markets, the price of coffee in New York on the day that the lot was sold is included.
5. To determine the seasonality in Indonesian coffee prices sine and cosine functions with 6 and 12 month periodicity are included.
6. To determine the impact of quantity in a lot on the price received, QTY_i is included.

In addition, in the Robusta model, CIF and CAF prices were sometimes reported. DUM_i is included to evaluated whether there is an intercept shift for the inclusion of insurance in the price.

The models were estimated using an estimated generalized least squares estimator that allowed for exponential heteroscedasticity. Data are analyzed using the SHAZAM computer software program. In order to estimate the

equations, base groups for each of the sets of dummy variables are selected. Definitions of the base groups affect how the parameter estimates are interpreted. In the Robusta model the base grade is dry processed, grade 4, the lowest grade for which multiple observations are available. For the Arabica model, the base grade is wet processed grade six, the lower of the two grades for which data were available. The base company in the Robusta model is PTP XXIX.

CHAPTER IV

RESULTS

Descriptive statistics of the variables in the Robusta and Arabica coffee price models are in Tables 4 and 5. Estimated parameters of the two models are in Tables 6 and 7. The Arabica and Robusta model R^2s are 0.854 and 0.924, respectively. The hypothesis that all of the parameters are zero are is rejected based on the model F-statistics. Tests conducted to analyze the significance of the sets of dummy and seasonality variables as a group are shown in Tables 6 and 7. The discussion of the results follows the organization suggested by the objectives.

Objective 1: The Wald test for grade is significant in the Robusta model and Arabica model.

For Robusta, grade is significant and the defect measures used in determining grades appear to provide useful information. As shown in Table 6, the model contains dummies for four washed-bean grades and one dry-processed grade with a low quality dry-processed grade as the base. After the agreement was abandoned, the large, medium and small number 1 washed grades are priced from 30 to 35.8 cents above

Table 4. Descriptive Statistics for the Variables in the Hedonic Model for Robusta Coffee.

Variable	Means	Standard Deviation	Description
CFCOM	1.448	0.528	Dependent Variable in US$ cent per kilograms
Base Grade	0.077		1 if the grade is 4 Dry Processed, zero otherwise.
Dry Process-1	0.029		1 if the grade is 1, zero otherwise
Wet Process-1L	0.237		if the grade is 1 Large, 0 otherwise.
Wet Process-1M	0.416		1 if the grade is 1 Medium, 0 otherwise
Wet Process-1S	0.108		1 if the grade is 1 Small, 0 otherwise
Wet Process-4LMS	0.126		1 if the grade is 4 Large, Medium and Small, 0 otherwise
PTP XVIII	0.201		1 if the government company is PTP XVIII, zero otherwise
PTP XXIII	0.367		1 if the government company is PTP XXIII, zero otherwise
PTP XXVI	0.324		1 if the government company is PTP XXVI, zero otherwise
PTP XXIX	0.109		1 if the government company is PTP XXIX, zero otherwise

Table 4. (continued)

Agreement	0.194		1 if ICA is still effective (before July 4, 1989), zero otherwise
Agreement and Dry Process-1	0.008		if Agreement and Dry Process-1 are 1, zero otherwise
Agreement and Wet Process-1L	0.021		if Agreement and Wet Process-1 Large are 1, zero otherwise
Agreement and Wet Process-1M	0.077		if Agreement and Wet Process-1 Medium are 1, zero otherwise
Agreement and Wet Process-1S	0.009		if Agreement and Wet Process-1 Small are 1, zero otherwise
Agreement and Wet Process-4LMS	0.007		if Agreement and Wet Process-4 Large Medium Small are 1, zero otherwise
Cash Price	1.933	0.446	Cash Price, New York US$ cents per kg
Quantity	41,651	40,947	Number of kgs in a lot sold

Table 5. Descriptive Statistics for the Variables in the Hedonic Model for Arabica Coffee.

Variable	Means	Standard Deviation	Description
CFCOM	2.578	0.982	Dependent Variable in US$ cent per kilogram
Wet Process-1	0.966		1 if the grade is 1 Wet Processed, zero otherwise
Wet Process-6M	0.020		1 if the grade is 6M Wet Processed, zero otherwise.
Wet Process-CR1	0.010		1 if the grade is CR-1 Wet Process, zero otherwise. Included in the intercept
Agreement	0.155		1 if ICA is still effective (before July 4, 1989), zero otherwise
Agreement and Wet Process-1	0.152		if Agreement and Wet Process-1 are 1, zero otherwise
Cash Price	1.862	0.424	Cash Price, New York, US$ cents per kilogram
Quantity	17,905	9,626	Number of kgs in a lot sold

Means of dummy variables indicate the percentage of the sample for which the variable is 1.

Table 6. Parameters Estimated for the Robusta Hedonic Coffee Price Model.

Variable[1]	Estimated Parameter	t-statistic
INTERCEPT	0.701	11.740***[2]
WALD-STATISTIC FOR GRADE[3]		739.260***
DRY PROCESS-1	0.015	0.389
WET PROCESS-1L	0.358	11.440***
WET PROCESS-1M	0.350	11.350***
WET PROCESS-1S	0.301	9.270**
WET PROCESS-4LMS	0.052	1.621
WALD-STATISTIC FOR COMPANY[4]		1.438
PTP XVIII	-0.001	-0.724
PTP XXIII	0.001	0.102
PTP XXVI	-0.006	-0.439
AGREEMENT	0.815	16.680***
WALD-STATISTIC FOR INTERACTION[5]		338.7740***
AGREEMENT AND DRY PROCESS-1	0.035	0.368
AGREEMENT AND WET PROCESS-1L	0.549	10.550***
AGREEMENT AND WET PROCESS-1M	0.509	11.980***
AGREEMENT AND WET PROCESS-1S	0.519	6.941***
AGREEMENT AND WET PROCESS-4LMS	-0.294	-4.484***
CASH PRICE	0.144	4.955***
WALD-STATISTIC FOR SEASONALITY[6]		29.426**
SIN12	-0.018	-3.204***
SIN6	0.014	2.433**
COS12	0.023	3.261***
COS6	-0.019	-4.955***
QUANTITY	-0.000	-3.581***
DUMMY	0.006	0.516

Table 6. (continued)

R-SQUARE	0.920[7]
F-STATISTICS	520.301***

[1]An EGLS estimator of Equation 2 is used to estimate the parameters. Exponential heteroscedasticity is corrected using Harvey's procedure (1976). The natural log of the absolute value of the errors from OLS estimation are regressed against all of the independent variables in the original equation. The results of that regression are:

$$\ln|\hat{e}| = -0.197 + 0.388DP1 + 0.971WP1L + 0.451WP1M$$
$$+0.640WP1S + 0.350WP4LMS + 0.177PTP18 + 0.109PTP23$$
$$+0.145PTP26 + 3.282AG + 0.311AG*DP1$$
$$-1.071AG*WP1L - 0.579AG*WP1M - 0.242AG*WP1S$$
$$-0.881AG*WP4LMS - 1.966CP - 0.155SIN_{12} + 0.380SIN_6$$
$$+0.158COS_{12} + 0.425COS_6 + 0.000000295QTY$$

[2]Three, two and one asterisk denote significance at the 1, 5 and 10 percent levels.

[3]The null hypothesis that grade does not affect selling price is rejected if the calculated χ^2 is greater than the critical value. The critical for the 1 percent level with two degrees of freedom is 9.21.

[4]The null hypothesis that company does not affect selling price is rejected if the calculated χ^2 is greater than the critical value. The critical for the 1 percent level with three degrees of freedom is 11.34.

[5]The null hypothesis that interaction between the agreement and grade does not affect selling price is rejected if the calculated χ^2 is greater than the critical value. The critical for the 1 percent level with five degrees of freedom is 15.09.

[6]The null hypothesis that seasonality does not affect selling price is rejected if the calculated χ^2 is greater than the critical value. The critical for the 1 percent level with four degrees of freedom is 13.28.

[7]The R^2 is unadjusted from the the second stage weighted regression.

Table 7. Parameters Estimated for the Arabica Hedonic Price Model.

Variable[1]	Estimated Parameter	t-statistic
INTERCEPT	1.528	10.090***[2]
WALD-STATISTIC FOR GRADE[3]		5.713*
WET PROCESS-1	-0.118	-1.524
WET PROCESS-6M	0.025	0.293
AGREEMENT	0.667	4.106***
AGREEMENT AND WET PROCESS-1	1.233	9.515***
CASH PRICE	0.496	5.366***
WALD-STATISTIC FOR SEASONALITY[4]		5.420
SIN12	0.041	2.210*
SIN6	0.001	0.049
COS12	-0.020	-0.882
COS6	0.007	0.314
QUANTITY	-0.000	-1.950*
R-SQUARE		0.854[5]
F-STATISTIC		166.114***

[1]An EGLS estimator of Equation 1 is used to estimate the parameters. Exponential heteroscedasticity is corrected using Harvey's procedure (1976). The natural log of the absolute value of the errors from OLS estimation are regressed against all of the independent variables in the original equation. The results of that regression are:

$$\ln|\hat{e}| = -4.263 + 1.315WP1 + 0.414WP6M - 1.009AG$$
$$+2.258AG*WP1 + 0.175CP - 0.170SIN_{12} + 0.090SIN_{6}$$
$$+0.128COS_{12} + 0.377COS_{6} + 0.000010638QTY$$

[2]Three, two and one asterisk denote significance at the 1, 5 and 10 percent levels.

[3]The null hypothesis that grade does not affect selling price is rejected if the calculated χ^2 is greater than the critical value. The critical for the 1 percent level with two degrees of freedom is 9.21.

[4]The null hypothesis that seasonality does not affect selling price is rejected if the calculated χ^2 is greater than the critical value. The critical for the 1 percent level with four degrees of freedom is 13.28.

[5]The R^2 is unadjusted from the second stage weighted least squares regression.

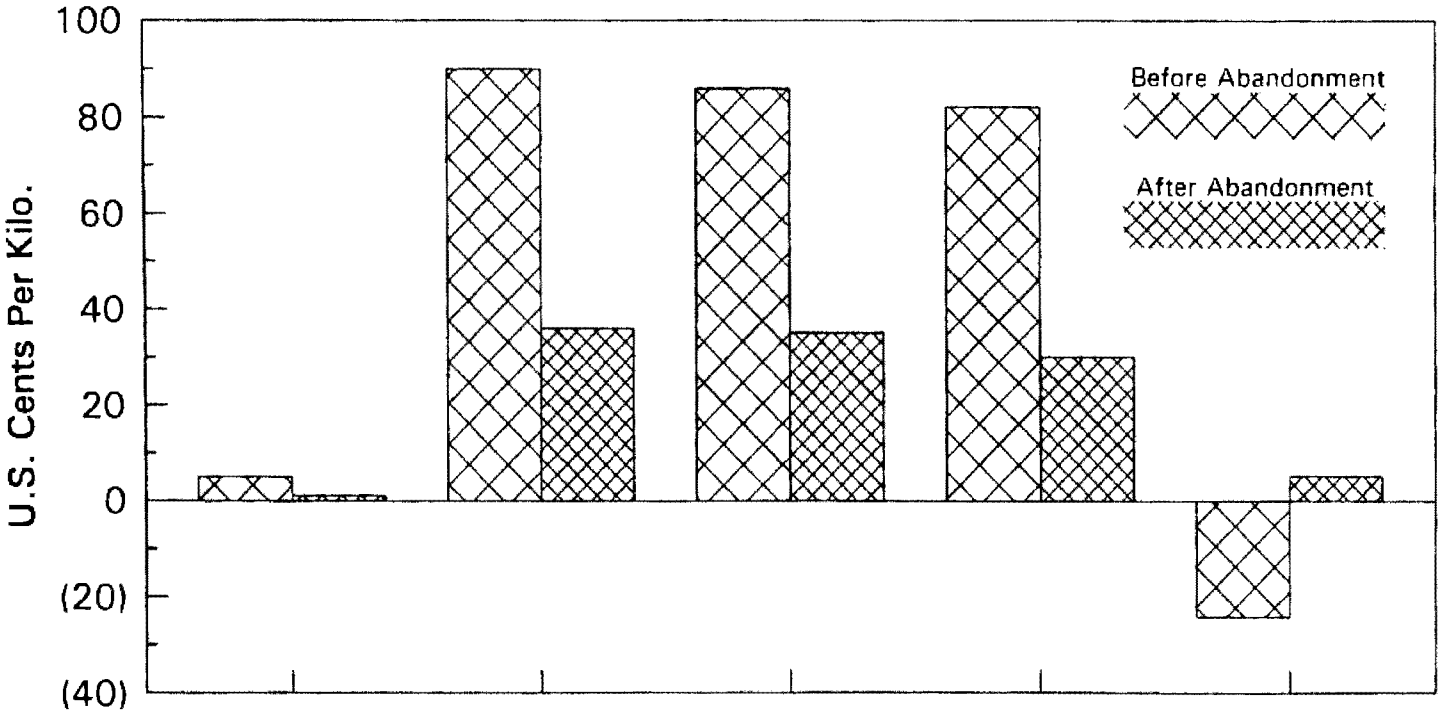
the base while the washed grade four of mixed sizes and the dry processed grade 1 only received 5 and 1.5 cent premiums over the base. High grades of washed beans have statistically significant and large positive coefficients. The intercept shifter for the lowest grade wet-processed bean is higher than the intercept shifter for the highest grade of dry-processed coffee beans. Nearly all dry processed beans are purchased by the PTPs from smallholders. The grade relationships in this section apply after the agreement was abandoned.

Objective 2: The Wald test for PTP indicates no evidence of reputation selling in the market for Robusta coffee. This implies that the grading system for Robusta coffee provides buyers with sufficient information about the quality of coffee produced by each PTP.

Objective 3: To measure the total effect of the abandonment of the International Coffee Agreement on coffee prices received by PTP enterprises both the intercept shift and the change in the cash price must be considered. Results in Table 6 and 7 show the large and highly significant positive impact that the International Coffee Agreement had on both Robusta and Arabica coffee equation intercepts. The results indicate that Arabica and Robusta coffee equation intercepts declined by $0.667 and $0.815 per kilogram. In addition, the agreement caused the New York price to decline and both Robusta and Arabica prices are related to the New York price. Every one cent decline in the New York price creates a 0.144 and 0.496 decline in Robusta and Arabica prices respectively.

Objective 4: The Wald test with the interaction variables in the Robusta model suggest that abandonment of the ICA did impact premiums and discounts of grades. Figure 2 shows the relative premiums and discounts by grade for Robusta coffee while the agreement was in effect and after the agreement was abandoned. During the agreement, high grades of wet-processed beans received 50.9 to 54.9 cents more than the dry-processed, base grade. Abandonment of the agreement substantially reduced the differentials paid between wet and dry-processed beans. Many dry-processed beans during the agreement may have been sold to non-quota markets while wet-processed beans were sold in quota markets. During the agreement, Indonesia also had a domestic quota divided among a limited number of exporters. A large price difference resulted from this situation, because exporters received a high price based on the export quota market, while prices received by farmers were very low and based on the non-quota market price. After the ICO dissolution exporters started to buy more directly from smallholders, causing the price received for smallholders to increase. At the same time, the world coffee price decreased after the agreement abandonment.

Figure 2. Premiums and discounts for Robusta coffee in Indonesia before and after the abandonment of the ICO



Coffee Grades	Dry Process-1	Wet Process-1L	Wet Process-1M	Wet Process-1S	Wet Process-4LMS
	5.017	89.885	85.905	81.983	(24.236)
	1.059	35.880	35.028	30.060	5.159

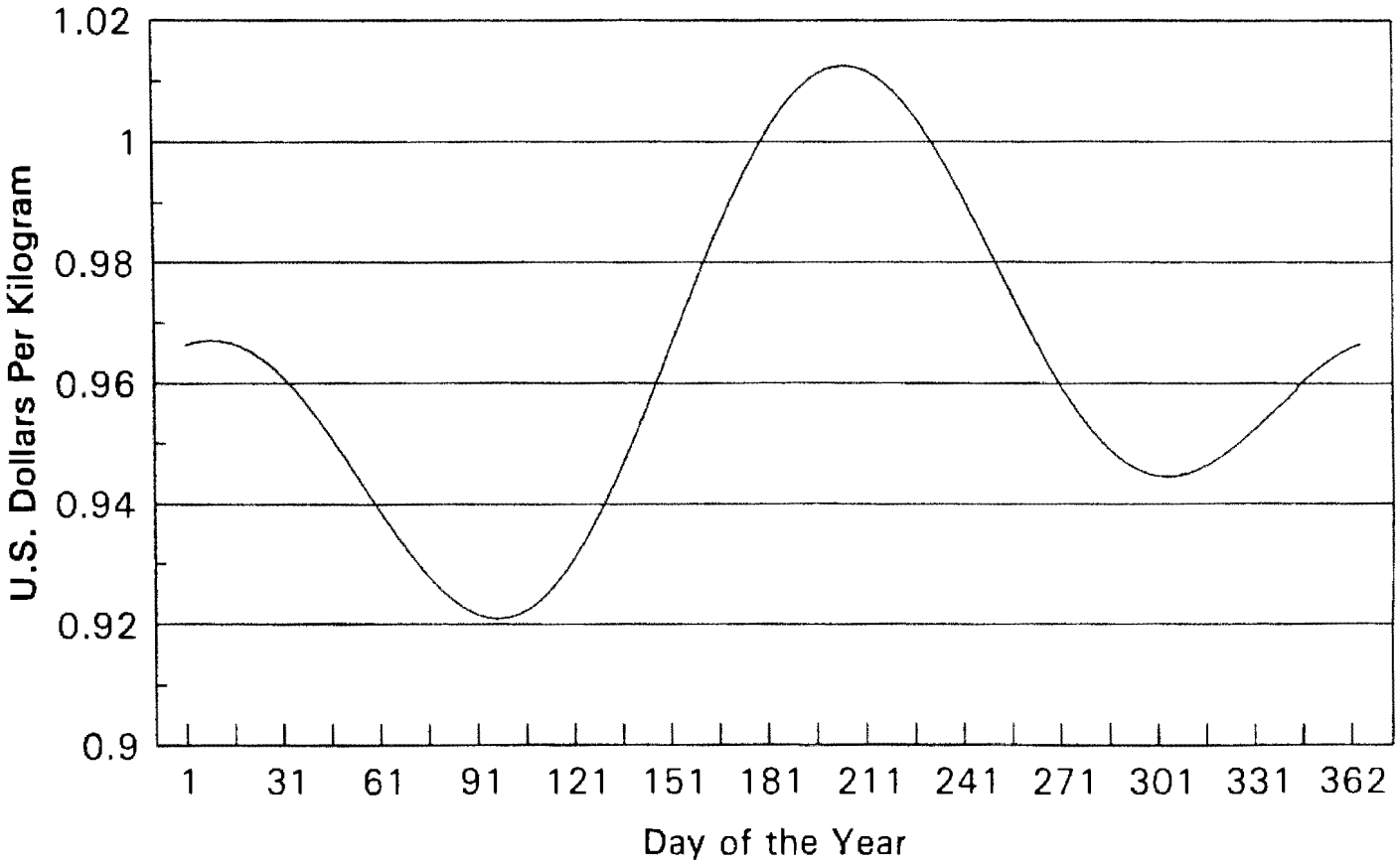
Similar results are shown in Table 7 for Arabica coffee. Only one grade was sold before and after the agreement. The price of that grade however, fell by $1.233 after the agreement was abandoned.

Objective 5: Robusta and Arabica coffee prices in Indonesia are positively and significantly related to the price of coffee in New York and the declining prices in international markets resulted in declining prices in Indonesia.

Objective 6: The Wald test for seasonality suggests that Robusta coffee follows a definite seasonal pattern and that Arabica coffee does not. Figure 3 is a graph of the Robusta equation for the base grade and company during the post-agreement period. Continuous variables are set at their mean values. The seasonal pattern corresponds to weather pattern in coffee producing areas with the highest prices during the dry season and prices lowest during the wet season.

Objective 7: The t-tests for QTY in the Arabica and Robusta models are both negative and significant at the 10 and 1 percent levels, respectively. The reasons for the lower prices for larger lots are not clear. Buyers of large quantities may be given a price discount.

Figure 3. Graph of seasonality of Robusta coffee prices using the estimates of Equation 2 presented in Table 6.*



*Note: Graph is for base group with all continuous variables at their mean values.

CHAPTER VI

CONCLUSIONS

Hedonic models can be used to explain variation in prices received by government-owned PTP companies in Indonesia. Important factors influencing prices of Robusta coffee are grade, seasonality, the cash price in New York, the International Coffee Agreement, and lot size. Reputation selling is not apparent among the PTP enterprises. For Arabica coffee, in addition to the International Coffee Agreement, grade, cash price and lot size are significant explanatory variables. For both Arabica and Robusta coffee, premiums for higher grades were substantially reduced following abandonment of the international coffee agreement.

Using hedonic price method, the PTP can evaluate which coffee characteristics affect price received. In particular, the results give specific quantitative discounts for different grades. Dry-processed beans are heavily discounted. If smallholders were to use wet processing they should expect to receive higher prices. Ways to encourage wet processing by smallholders should be considered if the costs of wet processing are less than the premiums paid for wet processed beans.

Price received by PTP enterprises in Indonesia declined as a result of the ICA dissolution. In addition, the results suggest that agreement dissolution decreased the premiums paid for higher quality washed processed beans. As a result, producers of wet-processed beans, like the PTPs, were hurt more by ICO abandonment than were smallholders. In addition, in any new agreement, negotiators may want to evaluate how alternative grades are affected by the terms of the agreement.

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